Science & Technical Support Section's
SciFYI
King County
Department of Natural Resources and Parks
Water and Land Resources Division
A science section digest of current environmental issues in King County
November 2013

What's happening with kokanee in Lake Sammamish?

by: Hans Berge and David Lantz

Male and female adult kokanee spawning in Ebright Creek, 2012. Photo: Roger Tabor, USFWS.

What are kokanee?

Kokanee salmon (Oncorhynchus nerka) are a non-migratory life history form of sockeye salmon native to the Pacific Northwest and Canada. Like other Pacific salmon, kokanee spawn during the autumn and their progeny hatch the following winter and spring. After hatching, the newly emerged kokanee fry immediately migrate downstream to a nursery lake. In the lake the kokanee feed primarily on zooplankton (Daphnia are their preferred prey) and insects and avoid being eaten by predators such as cutthroat trout. They spend between three and five years in their nursery lake before ascending into their natal streams once more to spawn. Unlike anadromous salmon, kokanee spend their entire lives in freshwater.

What is their history?

Two lakes in the Puget Sound region still have known populations of native kokanee: Lake Whatcom and Lake Sammamish. Historically, spawning kokanee in tributaries of Lake Sammamish numbered in the tens of thousands and spawned in more than a dozen streams. They were an important source of food for Native Americans and a very popular recreational game fish.

(Continued on page 2)

FIGURE 1.
Map of Lake Sammamish and four main tributaries that support kokanee spawning.

(Continued from page 1)

Declining returns during the 1980s and 1990s led to a complete closure of the recreational fishery on Lake Sammamish and prompted concern from citizens and agencies with jurisdiction along the lake. By the late 1990's, there were only four tributaries of Lake Sammamish that supported spawning kokanee (Figure 1), and since 1996, kokanee returns in Lake Sammamish tributaries have been highly variable (Figure 2).

This continued population decline prompted concern about kokanee survival and led to the filing of listing petitions (in 2000 and 2007) with the U.S. Fish and Wildlife Service (USFWS) to give Lake Sammamish kokanee protection under the Endangered Species Act. Ultimately, both petitions were rejected with the finding that the Lake Sammamish kokanee population was not a listable entity under the definitions in the USFWS Distinct Population Segment Policy.

Recovery efforts

In 2007 a local collaboration formed to focus on kokanee conservation in Lake Sammamish. The Kokanee Work Group (KWG) is chaired and coordinated by King County Department of Natural Resources and Parks and includes representation from each local government along the lake, several non-governmental conservation groups, the Washington Department of Fish and Wildlife (WDFW), the Snoqualmie Tribe, the USFWS, and watershed residents.

The goal of the KWG is to "prevent the extinction and improve the health of the native kokanee population such that it is viable and self-sustaining, and then supports fishery opportunities".

The first task of the KWG was to identify limiting factors and to prioritize immediate steps to address stressors and improve conditions for kokanee, and provide a forum to identify and help advance implementation of actions that need to be taken immediately to ensure kokanee persist in perpetuity.

FIGURE 2.
Area-Under-the-Curve escapement estimate for kokanee in four tributaries of Lake Sammamish (broodyears 1996-2012).

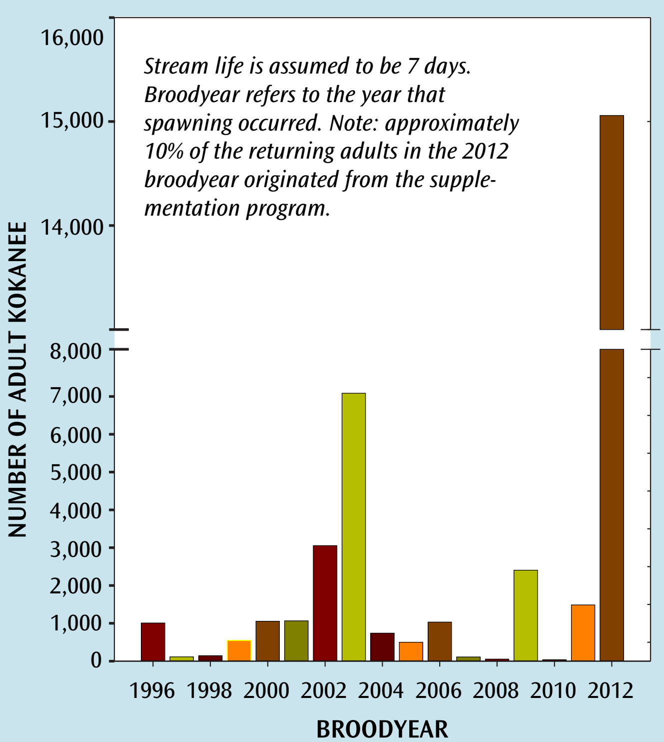
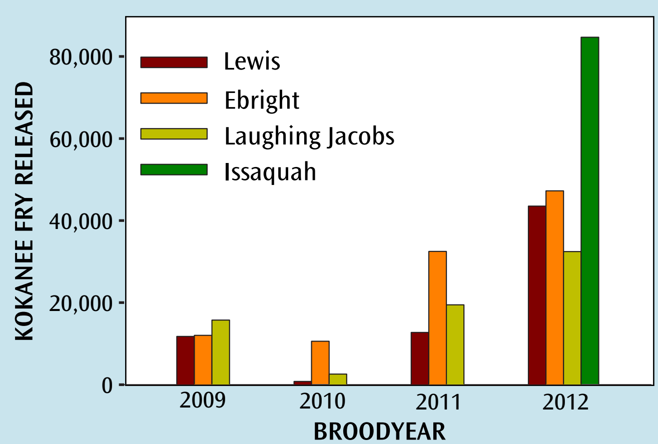
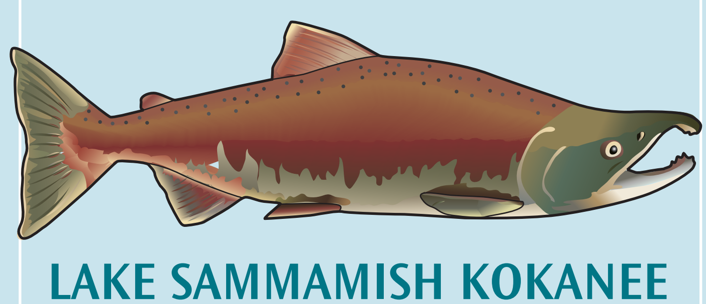


FIGURE 3.
Number of kokanee fry released from the Lake Sammamish kokanee supplementation program into natal streams for broodyears 2009 through 2012.





One major finding of the limiting factors report was the immediate need for an emergency supplementation effort to improve egg-to-fry survival synchronously with habitat restoration. In 2009, with the support of funds from the USFWS, WDFW, King County, the USFWS began collecting kokanee adults from the spawning grounds around Lake Sammamish and spawned them artificially at the Issaquah hatchery to augment and help sustain the natural spawning population.

Success of the planned 12-year supplementation program is measured by monitoring the abundance of spawners, phenotypic characteristics (sex ratio, age, size at age, proportion of hatchery fish in the broodstock, etc.) and genetic diversity. All hatchery reared kokanee are released with a unique thermal mark and adults from the spawning grounds and the broodstock are dissected for both otoliths and genetic tissues, providing an opportunity to compare both groups over time.

In the first year of the program, 101 adult kokanee (39 males and 62 females) were removed from the natural spawning grounds and spawned at the Issaquah Hatchery. Fertilized embryos were transported to two WDFW hatchery facilities for incubation to minimize risk.

After successfully hatching kokanee fry at the Landsburg and Chambers Creek hatcheries, more than 35,000 fry were released back to their natal tributaries of Lake Sammamish, adding to an estimated 150,000 natural origin fry entering Lake Sammamish in the spring of 2010. Since that first year, the supplementation program has followed the strength of the returns very closely (Figure 2). The largest production year was 2012 with more than 200,000 kokanee fry released into Ebright, Laughing Jacobs, and Lewis creeks, as well as an initial reintroduction of kokanee into Issaquah Creek (Figure 3).

The supplementation program in Lake Sammamish is unique in several ways. First, the program is designed to be temporary (12 years) and to complement ongoing restoration projects. For example, in 2013, kokanee were reintroduced in Issaquah Creek with the intent that fish passage will be provided when they return in 2016.

The novel techniques used in this program, such as incubating them on natal water sources using recirculating incubators, are tailored to improve the success of supplementation and reintroductions throughout the basin as stream habitat conditions improve.

In 2008-2010, favorable temperature and oxygen concentrations in Lake Sammamish, reduced predation from hatchery coho, favorable streamflow during incubation, and three year old recruits from the first year of the supplementation program all contributed to the largest return of kokanee observed since at least 1996 (Figure 2).

While approximately 10 percent of the total return in 2012 came from the hatchery, the real story is that 90 percent of the return originated from the natural spawning grounds. This resilience in the population suggests that there is potential for kokanee to thrive once again in Lake Sammamish if we continue to restore and reconnect extant habitat and do what we can to improve survival at each life stage.

While successful hatchery intervention is a necessary step to recover kokanee, the ultimate success of the KWG will be measured by having a population of kokanee that can support sustainable harvest independent of a hatchery program. The only way this will be possible over time is through habitat protection and restoration.

In 2008, the KWG received a grant from the King Conservation District to identify restoration actions that will benefit chinook and kokanee salmon in Lake Sammamish. These projects primarily focus on improving instream habitats, removing artificial barriers, and restoration of tributary deltas in Lake Sammamish.

Since that time, projects to benefit kokanee have been completed or are under way in Ebright (2012), Issaquah (2013) and Lewis (2010; 2014) creeks. This includes a privately-funded culvert replacement project completed in summer 2012 that approximately tripled the amount of spawning area for kokanee in Ebright Creek.

Looking ahead, King County Parks is developing a project to replace a culvert under the East Lake Sammamish Trail and thus help ensure unfettered access for kokanee to currently unused spawning area on Zaccuse Creek in Sammamish.

Conclusions

Native kokanee salmon in Lake Sammamish once provided an important fishery for harvest. With continued restoration and protection of kokanee to improve productivity, diversity, distribution, and abundance, there may be opportunities for harvest of kokanee again. The return in 2012 suggests that kokanee are resilient and can thrive in Lake Sammamish, and the focus of the KWG is to implement habitat restoration and protection actions throughout the basin to buffer against the effects of anthropogenic and natural stressors such as climate change.

For more information on kokanee in Lake Sammamish, please see the King County kokanee page: http://www.kingcounty.gov/environment/animalsAndPlants/salmon-and-trout/kokanee.aspx.

What rains on Vashon doesn't always stay on Vashon!

By Sevin Bilir and Eric Ferguson

The King County Science and Technical Support Section has been supporting a monitoring program of measuring precipitation, stream flow and groundwater on Vashon-Maury Island for a number of years in an effort to better understand the water resources on the Island.

The County works in conjunction with the Vashon-Maury Island Groundwater Protection Committee to implement the recommendations of the Ground Water Management Plan and address current local groundwater issues. This Committee represents many local interests, such as private and commercial well owners, businesses and tribal nations and serves the Island's community and advises the County and others on groundwater related actions and activities.

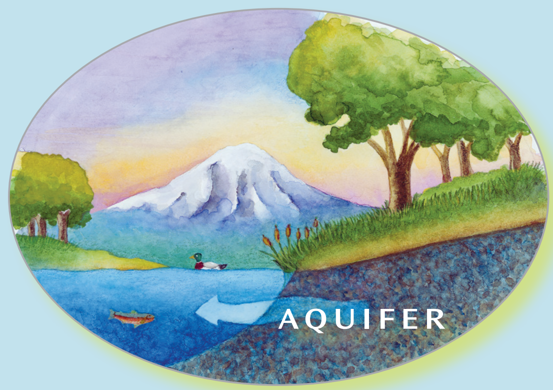
The County's Science and Technical Support Section has recently prepared a historical review of the water resources on Vashon-Maury Island, including a review of climate, marine water, surface water and groundwater data. This report is forthcoming to the public and is referenced at the end of this article.

Thanks to a successful community outreach and education program, Islanders know more about their water resources and the impacts that may reduce the availability for future use on Vashon-Maury Island. Photo: David Tiemann.

Aqui-what?

All drinking water sources on Vashon-Maury Island are supplied by rainfall. Rain soaks into the soil and is stored in the underlying sediment or rock. Aquifers are layers of sediment or rock that can hold water, much like a sponge that can still be wet after it has been squeezed. The groundwater in an aquifer is hidden from our view, but we see signs of groundwater, for example, in the form of springs along hillslopes and beaches where water can be seen flowing out of sands or gravels.

Water in geologic layers can leave the Island by flowing off the land, from springs and seeps on hillslopes, and from aquifers that discharge water to Puget Sound.



Living on a sole source aquifer

The Island was named a sole source aquifer in 1994 by the U.S. Environmental Protection Agency (EPA) and an Island Sole Source Aquifer by the County in 2005. The EPA defines a sole source aquifer as one that supplies half or more of the drinking water used in the area above the aquifer. These areas can have no other option for a drinking water source which could physically, legally, and economically supply all those who depend upon the aquifer for drinking water.

Impacts to water quality

Surface water and groundwater quality can be impacted naturally or as a result of human activity, such as construction activities, improper household waste disposal, fertilizer and pesticide use and faulty septic systems. Runoff (water flowing over the land surface) may pick up pollutants from wildlife and soils. Water sources that are closer to the ground surface are more vulnerable to contamination than those such as deep groundwater wells. Because over 50 percent of the Islanders obtain their water from water sources such as springs, surface water and groundwater that are close to the ground surface, it is important to monitor ongoing activities and water quality.

Yearly sampling and review of the health, types and number of bugs living in Judd Creek is key for evaluating and comparing stream health. Photo: Jo Wilhelm.

Surface water

Many of the creeks are fish-bearing and lead to Puget Sound. Studies have shown that the overall condition of surface water is improving as measured by the stream water quality index. Also, annual measurements bugs living in the streams show variability with some sampling locations improving and some worsening.

Stream temperatures in various creeks typically met the state criteria for good water quality status. Annual measurements of the magnitude of low flows and how often and how long high stream flows last indicate that responses are as expected with increases during wet years and decreases during dry years.

Groundwater

The groundwater water quality is good overall. Although nitrate concentrations showed increases at different times since 1967, recent testing indicated that most groundwater samples had no change in nitrate while some had increases and some had decreases. With the exception of arsenic above the EPA drinking water standard in a few wells, there were no exceedances for all other parameters tested. Wells with arsenic exceedances have deeper water-bearing zones that appear to have naturally occurring arsenic. Required water quality testing for public water systems, as sent to Washington State Department of Health, also reported no exceedances.

Thanks to a successful community outreach and education program, Islanders know more about their water resources and the impacts that may reduce the availability for future use on Vashon-Maury Island.

How much water are we using?

The major use of water on the Island is for municipal and domestic purposes; lesser uses are for agricultural and commercial purposes. Based on a set group of volunteer permit exempt well owners, the measured average consumption of groundwater was around 103 to120 gallons per day (gpd). Public water systems reported an average daily use of about 100 to 200 gpd. Although Islanders have varying patterns of usage, it is common for increases in usage to occur during June through October.

Projections of population growth have been reported at 100 people per year and water demands increasing by 10 percent each year. Recent water use and demand modeling indicated that with respect to population growth and water use projections, lowering of water levels near larger public water system wells was noticeable.

Future challenges

A changing climate in the environment and within politics for the local, state and federal administrations are a challenge for any area where water resources are of interest. Maintaining a close relationship with residents and stakeholders under a reduced budget is a challenge and recent evidence shows that with reduction in volunteerism on Vashon-Maury Island, water resources data that may help with understanding the impacts on where water is available and where water is impacted are not being collected. Keeping the public educated and interested enough to engage in water resource activities is dependent on funding and a challenge to benefit from the knowledge gained from reduced or defunct programs.

Report Citations and Sources

- King County. 2013. Vashon-Maury Island Water Resources – A Retrospective of Contributions & Highlights–DRAFT. Prepared by King County Department of Natural Resources and Parks, Water and Land Resources Division, Science and Technical Support Section. Seattle, Washington.

- For more on the Groundwater Program on Vashon-Maury Island, go to http://www.kingcounty.gov/environment/waterandland/groundwater.aspx

Swimming Beach Monitoring Program

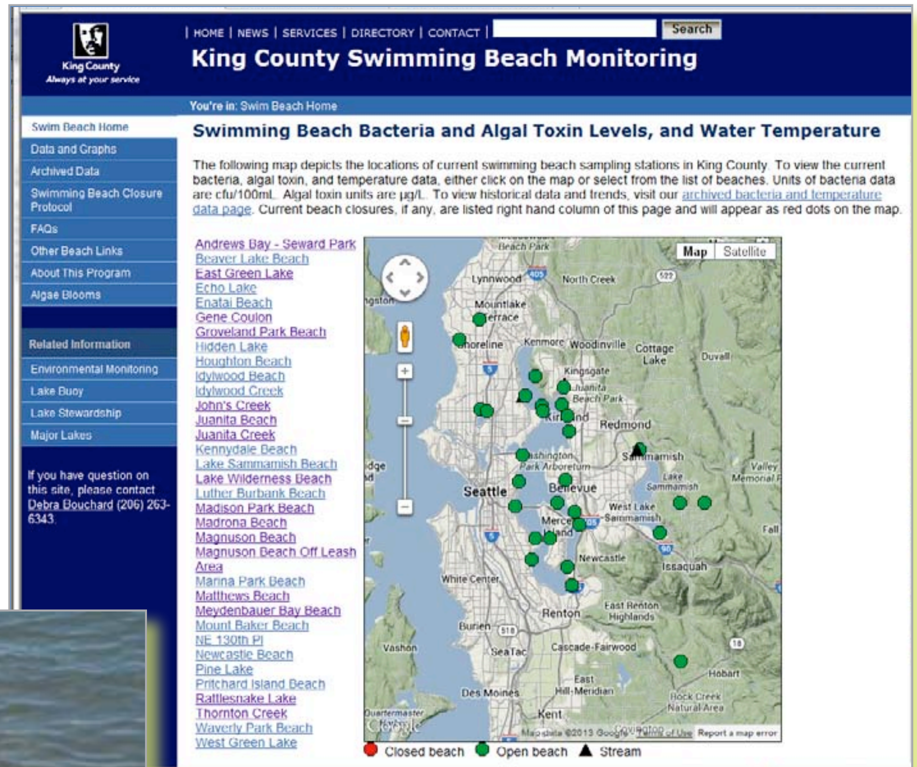
by Debra Bouchard

What we do and why we do it

King County routinely monitors swimming beaches, working with Public Health–Seattle & King County (Public Health) and cities, to protect public health. This includes fecal coliform bacteria monitoring from mid-May through mid-September, and algal toxin monitoring from late May through the end of October.

On Mondays, samples are collected at specified swimming beaches (listed on web page shown above). Laboratory analysis for bacteria is completed within 24 hours and algal toxin results are done within three to four days.

If any test results exceed guidance values, Public Health and the local jurisdiction managing the beach is notified. King County staff work with both Public Health and the affected jurisdiction to follow up and take appropriate action with established protocols. Public Health determines the public health implications and advises managing jurisdictions how to proceed. For more information about the program and to view data collected, please visit the King County Swimming Beach Monitoring Program website at http://green.KingCounty.gov/SwimBeach.



Visit the King County Swimming Beach Monitoring web page for more information about the program.

Blue-green algae bloom.

Bacteria

Fecal coliform (FC) bacteria in lake waters indicate a higher probability that the water has been contaminated with fecal material from humans, birds or other animals. Although FC are usually not harmful themselves, they often occur with other disease-causing bacteria, such as E. coli, so their presence indicates a potential risk to human health.

For bacteria, the King County Swimming Beach Monitoring Program uses the Ten State Standard as protocol for beach closures. If the routine sample collected on Monday exceeds the Ten State Standard the field crew will return to the beach that had the high value on Tuesday and collect three more samples. If this re-sampling confirms the high value, then Public Health along with the managing jurisdiction will take appropriate action – often a beach closure followed by periodic testing until the problem is resolved.

Algal toxins

Cyanobacteria, also called blue-green algae, commonly grow in lakes and sometimes produce toxins. Toxicity is hard to predict, can't be identified visually, and only a lab test can confirm its presence. The two most common toxins in Washington waters are microcystin and anatoxin-a. Both have recreational guidance values set by the state. Microcystins affect the liver, while anatoxin-a affects the nervous system. These two cyanotoxins were added to the routine monitoring of swimming beaches in 2005.

If cyanotoxin results exceed state guidance levels, Public Health is contacted and protocols for further action at the lake are put into action. Depending on the concentration of algal toxin measured, the lake is posted with a "Caution" "Warning" or "Danger" sign, and the lake is sampled weekly until values are back below guidance levels.

The Swimming Beach Monitoring Program is one of several monitoring programs that are important to King County residents who value water quality and enjoy recreating in our shared water resources. These monitoring programs can be an important tool in identifying potential pollutant sources so that appropriate action can be taken.

Preventing further spread of New Zealand mudsnails

by Jo Wilhelm, Sally Abella

Highly invasive New Zealand mudsnails (Potamopyrgus antipodarum) are tiny, non-native animals that have been living in King County streams since at least 2009. Infested waters include Thornton Creek and the adjacent Lake Washington shoreline (Seattle), Kelsey and Valley creeks (Bellevue), and McAleer Creek (Lake Forest Park).

The snails are hardy, adaptable animals that reproduce quickly and can easily be transported to new areas by people, animals and equipment. Studies suggest that New Zealand mudsnails can alter stream chemistry, drive out native animals, and disrupt the natural food web, causing further harm to threatened and endangered salmon runs. Once they show up, it is impossible to get rid of them. Therefore, containing their spread is a high priority.

The Water and Land Resources Division's Science and Technical Support Section is working with partners to: (1) educate environmental professionals about decontamination procedures, (2) develop resources for mudsnail identification, (3) analyze water quality data to assess the suitability of our streams for mudsnails, and (4) conduct targeted surveys when and where possible.

How can you help?

- Inspect, scrub, rinse, and drain all gear between field sites. In areas of known infestation, add one of the following decontamination methods: freeze for 8 hours, soak in hot water (140°F for 5 min), dry completely for more than 48 hours, or apply an appropriate chemical solution.

- Keep an eye out for snails wherever you enter the water! Learn how to identify mudsnails and distinguish them from native snails (see the King County link below for a field identification card) and report possible sightings to Washington Department of Fish and Wildlife online at http://wdfw.wa.gov/ais/reporting/. In King County please contact Sally Abella or Jo Wilhelm (sally.abella@kingcounty.gov, jo.wilhelm@kingcounty.gov).

The snail on the left is the New Zealand mudsnail. The other five are native snails, and some juvenile stages of native snails are similar in size to New Zealand mudsnails, so size may not be a good characteristic for identification.
Photo: Jennifer Vanderhoof.

A Science 'SHOUT OUT'

Ray Timm, one of the scientists in the King County Science and Technical Support section, successfully defended his doctoral dissertation, "Changes in fluvial habitat conditions across a disturbance continuum: implications for salmon restoration," in the School of Aquatic and Fishery Sciences at the University of Washington.

Timm studied how human and natural disturbance regimes influenced the population structure of sockeye in the Cedar River. When the Nisqually earthquake triggered a channel-damming landslide in 2001, habitat conditions changed dramatically and the fish responded accordingly at the population scale.

Timm's dissertation consisted of three complimentary models:

- He developed a spatially explicit watershed and riparian habitat model to quantify site characteristics and restoration potential in the lower Cedar River;
- He used a digital elevation model differencing technique to quantify the spatial and temporal geomorphic responses of the channel-floodplain ecosystem to the landslide disturbance;
- Finally, he developed a dynamic multivariate statistical model to uncover which variables were the most important for spawning fish across a range of changing conditions.

Together, these three models explain how river habitats respond to large disturbances, and how changes in habitat conditions influence salmon population behavior. This study provides insight into the magnitude and intensity of habitat restoration necessary to restore critical habitat functions of river landscapes that are vital to recovering salmon.

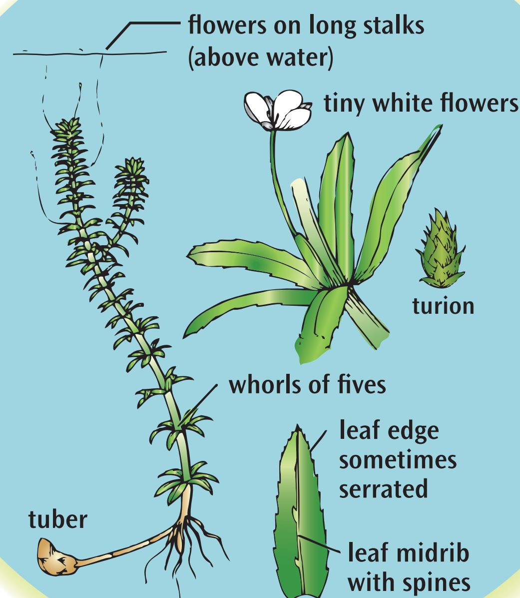
For more information on his work go to http://scholar.google.com/citations?user=lkBk9DsAAAAJ&hl=en

Hydrilla eradication in King County

By Beth Ledoux and Sally Abella

In 1994, the Class A noxious weed Hydrilla verticillata (hydrilla) was discovered to be thriving in Pipe and Lucerne lakes in King County. At that time it was the only infestation in the entire northwest, and it has remained the only one in Washington state to date. Pipe and Lucerne lakes are located in the Green-Duwamish River watershed in King County and within the city limits of Maple Valley and Covington. Although they are named separately, Pipe and Lucerne are connected by a small channel and share similar water quality and ecological characteristics.

FIGURE 1.
Hydrilla vertillicata



The hydrilla population was originally misidentified in the lakes as native elodea (Elodea canadensis) until 1994 when King County staff asked for species confirmation from Washington Department of Ecology experts. DNA analysis has since shown that the hydrilla in Washington is likely of Korean origin, most likely introduced to the lakes from someone dumping an aquarium into the lake or from a piece on an ornamental water lily planted in the lake.

Hydrilla is considered one of the worst aquatic weeds in the country.

Hydrilla is considered one of the worst aquatic weeds in the country. It propagates through fragmentation, tubers, turions (vegetative buds), and seeds, making it a difficult plant to control and eradicate (Figure 1). Hydrilla can degrade the ecological integrity of a water body quickly by forming dense mats that dominate water bodies, choke out native aquatic vegetation, and alter the predator-prey relationships among aquatic animals. These mats can also decrease dissolved oxygen by inhibiting water mixing areas, increase water temperature by absorbing sunlight, create mosquito breeding areas, and negatively affect recreational activities such as swimming, fishing and boating.

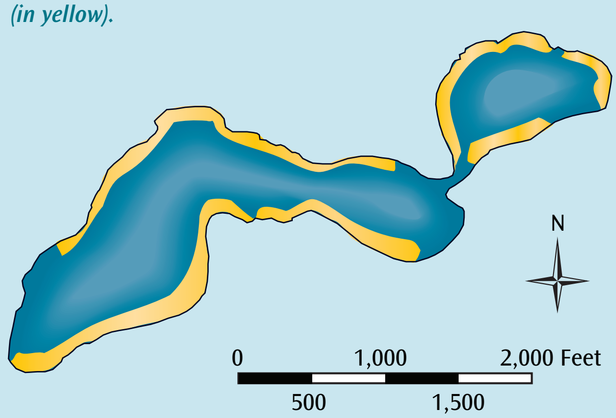
Hydrilla is native to parts of Asia, Africa and Australia, and in the 1950s it was introduced to Florida through the aquarium trade. It has since spread north and west to Texas and California, throughout the southeastern states, and as far north as Maine in the east and Washington state in the west. There were at least two different introductions of the plant because two distinct varieties, monoecious (having both male and female flowers on the same plant) and dioecious (all female or male flowers) are found in North America. The monoecious variety is found in the more northern locations, while dioecious hydrilla predominates in the southern United States.

Because further spread of hydrilla could cause expensive and widespread ecological damage, the Washington Department of Ecology (WDOE) and King County Water and Land Resources Division staff took immediate action to begin the eradication process in the lakes once the identification was confirmed. The county took on project management with the goal of eradication, funded through a grant from WDOE. When the cities of Maple Valley and Covington incorporated, they also agreed to help the effort by providing matching dollars for the grant.

Herbicide treatments and removing hydrilla by hand by private contractors occurred between 1995 and 2002. While a major decrease in hydrilla was found during this period, the decrease was not quantified and was reported by mapping gnerealized areas where some hydrilla remained. In 2001 and 2002, only handpulling by divers was used in response to a legal challenge to the permitting processes used to control and monitor herbicide applications. At the end of 2002, a survey of the two lakes showed that hydrilla was increasing in the lakes and a new strategy was necessary.

In 2003, Ecology and King County created an eradication plan that included slow-release granular fluridone herbicide (Sonar PR) and diver surveys. The Water and Land Resources Division began herbicide treatments and contracted for the independent diver surveys. Herbicide treatments were to continue for three years after the last hydrilla plant was found, and then followed with surveys for three more years after the last treatment.

FIGURE 2.
Areas of herbicide application in Pipe and Lucerne Lakes (in yellow).



Sonar PR application started in 2003, with a target concentration of five parts per billion (ppb) throughout the growing season. This required at least three applications of granular Sonar PR each season – in late spring, early summer, and midsummer. The herbicide was applied in areas of infestation (Figure 2) with a three acre application buffer to ensure that new shoots from tubers came in contact with the herbicide.

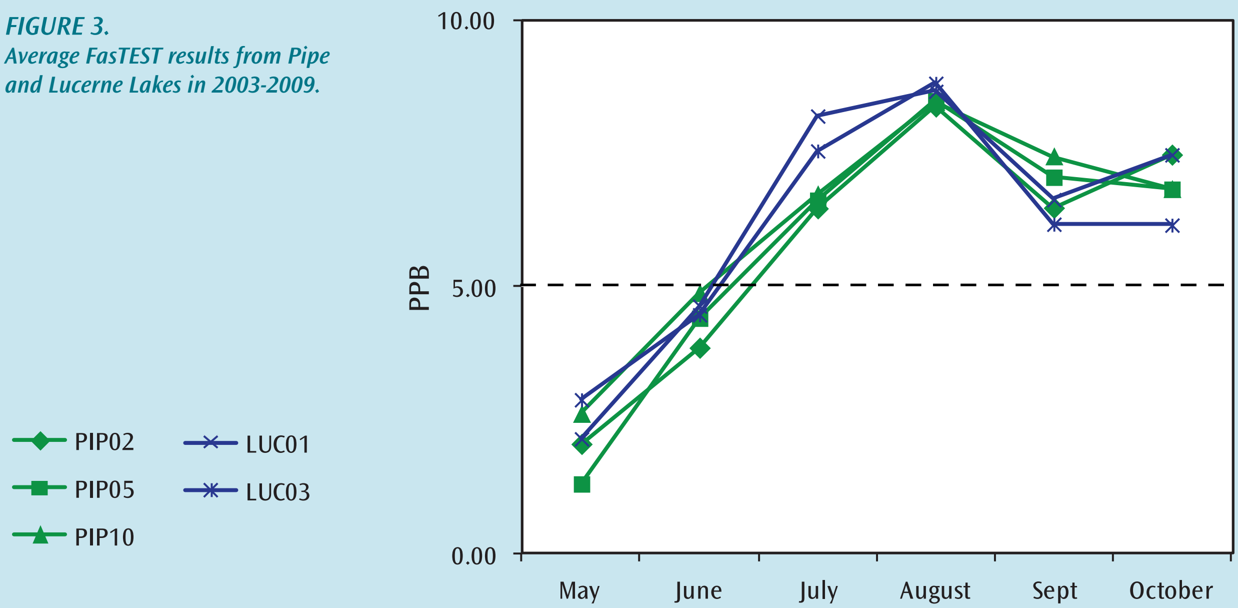
To track herbicide concentrations in the lakes and ensure proper application, water samples were sent to SePro Labs every two weeks for analysis (called FasTests by the company). The chart below shows average results over the summer at different locations throughout the two lakes (Figure 3).

The active ingredient fluridone was generally found at very low levels in the beginning of the growing season, thought to be residual from the previous year of application. The concentrations increased at the beginning of the season and then tapered off slowly from the last treatment through fall.

Surveys were done three times each summer by a contractor using SCUBA divers to assess the effectiveness of the herbicide treatments by counting remaining plants in the lakes. At the same time, shallow water along the shoreline was surveyed by Water and Land Resources Division staff using snorkeling equipment. In 2003, 474 plants were found, while 146 were found in 2004. In 2005, only 23 plants were found and all were in Pipe Lake, while in 2006 only two plants were found. Finally, in 2007 no plants were found in either lake. After 2007, the focus of the surveys shifted from treatment effectiveness monitoring to searching for hydrilla resurgence and recording the rebuilding of the native plant population.

Hydrilla has not returned to the lakes since its eradication in 2007. The last herbicide treatments were carried out in 2007 for Lucerne and in 2009 for Pipe. No hydrilla has been found in the intervening years and only one survey was carried out in 2012. There are two more surveys scheduled, one for 2013 and one for 2014. If at that point no further hydrilla plants have been found, WDOE and King County will declare hydrilla eradicated from Washington state.

FIGURE 3.
Average FasTEST results from Pipe and Lucerne Lakes in 2003-2009.



Contributors to King County's SciFYI

Sally Abella

Sally is a senior limnologist and engineer leading the freshwater assessment group in the Science Section of the King County Water and Land Resources Division. She is involved in a wide range of projects related to water quality improvement and monitoring on lakes and streams around the county, both as a subject matter expert and as a program and project manager.

Hans Berge

Hans Berge is a senior ecologist in the Science and Technical Support Section within King County's Water and Land Resources Division. He is a certified fisheries biologist and has worked on salmon recovery projects across all watersheds in King County since 1999. Much of his work has focused on research related to habitat preferences and productivity of native fishes, but he also contributes to a wide range of projects across many aspects of aquatic ecology. His work often includes collaboration with partners from federal, state, and local jurisdictions.

Sevin Bilir

Sevin is a hydrogeologist in the King County Science and Technical Support Section on projects in need of groundwater expertise. Sevin is a licensed hydrogeologist in Washington and California, with 19 years of experience. Her current work focuses on reporting the KingSTAT Environmental Indicators and developing a 3D hydrogeologic computer model of the Cedar Hills Regional Landfill.

Debra Bouchard

Debra Bouchard has been a senior limnologist/water quality planner with the King County Science and Technical Support Section since 1999. She manages the County's Swimming Beach Monitoring Program and co-manages the Lakes and Streams Routine Monitoring programs.

Eric Ferguson

Eric is a hydrogeologist who has been with the King County Science and Technical Support Section for 14 years. He works for internal clients, such as the Wastewater Treatment Division, Solid Waste Division, and Water and Land Resources Division on projects in need of groundwater expertise. He currently works on Vashon sustainability monitoring and other water resources projects.

Daniel Lantz

Daniel Lantz has worked as an Environmental Scientist in the Science and Technical Support section within King County's, Water and Land Resources Division since 2010. His primary focus is working on salmon recovery throughout King County, specifically Lake Sammamish kokanee, Lake Washington chinook, and various restoration monitoring projects. Before coming to King County, Daniel worked for over 11 years with the U.S. Fish and Wildlife Service as a fish biologist, in northern California and Washington, on a variety of fisheries projects, such as bull trout habitat selection, juvenile chinook salmon habitat selection, restoration monitoring, large river habitat surveys, culvert surveys, and urban stream classification.

Beth leDoux

Beth leDoux has worked with Water and Land Resources Division since 2003. She is a Seattle native and did her BA in environmental policy and planning at the Huxley School of the Environment at Western Washington University. She spent two years in AmeriCorps before getting her masters degree in environmental management from the Yale School of Forestry and Environmental Studies.

Jo Wilhelm

Jo is an ecologist in the Science Section of King County Water and Land Resources Division. Jo has primarily worked on stream and wetland monitoring, as well as assessment projects around the County, focusing on improving benthic macroinvertebrate information throughout Puget Sound.

Published by:

King County
Department of Natural Resources and Parks
Water and Land Resources Division
Science and Technical Support Section

Section Manager: Dave White

Newsletter Coordinator: Larry Jones

Editor: Doug Williams

Designer: Laurel Preston

Web Design/Production: Fred Bentler

Available on the Web at:
http://www.kingcounty.gov/environment/wlr/science-section/sci-fyi-newsletter.aspx

Send questions, comments and future story ideas to:

Kate O'Laughlin - kate.olaughlin@kingcounty.gov, 206-477-4789

Jim Simmonds - jim.simmonds@kingcounty.gov, 206-477-4825

File: 1311_3516L_SciFYInews.indd lpre 1202M